

Information Science and Technology Seminar Speaker Series



Lori A. Dalton
The Ohio State University

Optimal and Predictive Classification and Error Estimation

Wednesday, March 12, 2014

3:00 - 4:00 PM

TA-3, Bldg. 1690, Room 102 (CNLS Conference Room)

Abstract: Informatics based discovery can be greatly accelerated by integrating existing theory with big data, particularly when sample points are expensive or difficult to acquire. This is because the predictive capacity of a classifier is quantified by its error rate, and a purely data-driven approach requires a large number of examples to guarantee accurate error estimation. Realizing the need for a general model-based framework to integrate scientific knowledge on the mechanisms governing the behavior of a system with observable data, in this talk I will present a Bayesian approach for optimal and predictive classification and classifier error estimation.

The basis of the method is to construct a prior distribution over an uncertainty class of probabilistic models, effectively constraining the relationship between observations and the decision to be made with a higher weight on models most consistent with available scientific knowledge. Using Bayesian estimation principles, this prior is integrated with observed data to produce a posterior distribution. We then formulate classification and error estimation as optimization problems in this Bayesian framework, leading to (1) optimal classifiers, (2) optimal minimum-mean-square-error (MMSE) estimators of classifier error, and (3) a sample-conditioned mean-square-error (MSE) quantifying the accuracy of error estimation. In essence, this work puts forth a rigorous methodology to find these optimized tools, all taking into account both theoretical and empirical knowledge available.

Biography: Lori A. Dalton is currently an Assistant Professor in the Department of Electrical and Computer Engineering and the Department of Biomedical Informatics at The Ohio State University in Columbus, OH. She received the B.S., M.S. and Ph.D. degrees in electrical engineering at Texas A&M University, College Station, in 2001, 2002 and 2012, respectively. She was awarded an NSF Graduate Research Fellowship in 2001, she was sole recipient of an AFCEA Fellowship in 2003, and she was awarded a P.E.O. Scholar Award in 2010. Her current research interests include pattern recognition, classification, clustering, and error estimation.

For more information contact the technical host Turab Lookman, txl@lanl.gov, 665-0419 or Frank Alexander, fja@lanl.gov, 665-4518.